REMARKS

Summary

The independent claims have been amended to overcome the outstanding formal rejection under 35 U.S.C. § 101. In addition, the independent claims have been amended to recite at least one feature not understood to be disclosed or suggested by the patents to Fraser et al., Katzenberger, and Politis. Therefore, the application is now in allowable form.

Status of the Claims

Claims 1-3, 5-14, 16-25, and 27-33 are pending, with Claims 1, 7, 9, 12, 18, 20, 23, 29 and 31 being independent. Claims 4, 15 and 26 are cancelled herein without prejudice to or disclaimer of the subject matter contained therein. Claims 1, 7, 9, 12, 18, 20, 23, 29 and 31 have been amended to improve their form and to overcome formal and substantive rejections.

Requested Action

Applicant respectfully requests the Examiner to reconsider and withdraw the outstanding rejections in view of the foregoing amendments and the following remarks.

Applicant also respectfully requests that this Amendment be entered. This Amendment could not have been presented earlier as it was earnestly believed that the claims on file would be found allowable. Given the Examiner's familiarity with the application, Applicant believes that a full understanding and consideration of this Amendment would not require undue time or effort by the Examiner. Moreover, for the reasons discussed below, Applicant submits that this Amendment places the application in condition for allowance. At the very least, it is believed to

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place the application in better form for appeal. Accordingly, entry of this Amendment is believed to be appropriate and such entry is respectfully requested.

Formal Rejection

Claims 1-8, 18, 19 and 23-30 have been rejected under 35 U.S.C. § 101, as being directed to non-statutory subject matter. In response, while not conceding the propriety of the rejection, independent Claims 1, 7, 9, 12, 18, 20, 23, 29 and 31 have been amended to address the points raised by the Examiner. Applicant submits that as amended, these claims and their dependent claims now even more clearly are directed to statutory subject matter, similar to Claims 9-17, 20-22, and 30-33, since the amended claims are directed to a tangible, practical result — rendering a directed acyclic graph or an expression tree into a raster pixel image having a plurality of pixel locations. Therefore, as amended, these claims now even more satisfy 35 U.S.C. § 101. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Substantive Rejections

Claims 1-6, 12-17 and 23-28 have been rejected under 35 U.S.C. § 103(a), as being obvious over AU 9947508 (<u>Fraser et al.</u>) in view of U.S. Patent No. 5,970,496 (<u>Katzenberger</u>) and U.S. Patent No. 5,745,121 (<u>Politis</u>). Claims 7-11, 18-22 and 29-33 have been rejected under 35 U.S.C. § 103(a) as being obvious over the <u>Fraser et al.</u> patent in view of the <u>Politis</u> patent.

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Response to Substantive Rejections

In response, while not conceding the propriety of the rejections, independent Claims 1, 7, 9, 12, 18, 20, 23, 29 and 31 have been amended and Claims 4, 15 and 26 have been cancelled without prejudice. Applicant submits that as amended, these claims are allowable for the following reasons.

A. Independent Claims 1, 12, and 23

Amended independent Claim 1 relates to a method of rendering a directed acyclic graph into a raster pixel image having a plurality of pixel locations. The directed acyclic graph comprises one or more parent nodes and one or more leaf nodes. Each parent node represents an operator and has branches to respective descendent nodes, and each leaf node represents a graphic object having object edges.

The method comprises the step of determining groups of one or more pixel locations, wherein the groups are bounded by the object edges.

The method also comprises the step of determining, for each group, a portion of the directed acyclic graph in accordance with activities of the operators, wherein the portion of the directed acyclic graph is that portion which passes data up the directed acyclic graph.

The method further comprises the step of traversing, for each group, the determined portion of the directed acyclic graph.

In addition, the method comprises the step of generating, for each group, instructions for the traversed portion of the directed acyclic graph, wherein operator instructions are generated for those operators of the traversed portion of the directed acyclic graph having active branches and

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wherein leaf instructions are generated for those graphic objects which are active at the group of one or more pixel locations.

Finally, Claim 1 recites the step of executing, for each group, the generated instructions to render the graphic objects at the one or more pixel locations.

By this arrangement, to generate instructions, only the portion of the graph that passes data up the graph is traversed. As a result, this conditional-traversal method generates only relevant instructions.

In contrast, the patents to Fraser et al., Katzenberger, and Politis are not understood to be directed to any such conditional-traversal method. More specifically, these patents are not understood to disclose or suggest traversing, for each group of one or more pixel locations, a portion of the directed acyclic graph which passes data up the directed acyclic graph, and generating, for each group, instructions for the traversed portion of the directed acyclic graph, as recited in amended Claim 1.

For example, column 9, lines 31-43 of the Politis patent is understood to merely teach the sorting and pruning of a list of previously-generated instructions, which operations the present invention does not need to perform because it does not generate unnecessary instructions:

> . . . it is inefficient to scan all the linear render list for every scan line, a sort of the linear render list can be undertaken, with the list being sorted by the starting scan line of a particular graphical element. . . . At the start of each scan line, instructions which begin on that scan line are merged into the active list, and instructions that are no longer relevant are taken out of the active list.

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In addition, column 11, line 65 through column 12, line 38 of the Politis patent is understood to describe a method for converting an expression tree to a corresponding render instruction set list, so that the entire expression tree is traversed when generating the list of render instructions.

Page 7 of the Office Action appears to take issue with these statements. This portion of the Office Action asserts that "the tree is traversed as the rasterizing/scanning process occurs" and "the trees are constructed during each line scan". But, Applicant (who is the assignee of the Politis patent) respectfully disagrees. In the Politis patent, the trees are not understood to be constructed or traversed during each scan line. Rather, in the patent to Politis, the tree is understood to be traversed at least three times — twice to generate and minimize the bounding boxes ("bottom-up or post-order", and then "top-down or pre-order"), and then once top-down to generate the render list. All three traversals in the Politis patent are understood to be performed before the scan line-ordered rendering described in column 9, lines 31-43.

The patents to Fraser and Katzenberger are also not understood to disclose or suggest the conditional-traversal method recited in Claim 1. For example, the Fraser patent is not understood to perform a conditional traversal of the expression tree. Rather, as is understood to be described, for example, at pages 47-49, the Fraser patent teaches the traversing of the entire tree and, where appropriate, generates a null operation or NOP. The Katzenberger patent is merely understood to describe a method and system for storing information in a computer system memory using a directed acyclic graph structure having related data nodes.

Thus, these patents are not understood to disclose or suggest at least one feature of amended Claim 1. And since MPEP § 2142 requires the cited art to disclose or suggest all the claimed features to establish a prima facie case of obviousness, the Patent Office is not

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understood to have established a prima facie case of obviousness against Claim 1 over this art. Accordingly, Applicant respectfully requests that the rejection of Claim 1 be withdrawn.

MPEP § 2142 also requires that there "be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings". As a result, the pages 8 and 9 of the Office Action provide a possible rationale for combining the references to produce the claimed invention: "Politis teaches the use of bounding boxes to draw polygons, which is less efficient that the method of Fraser. ... Fraser's method is faster and more efficient, and only draws the areas necessary ... Therefore, it would be obvious to modify the combination of Politis and Katzenberger in view of the teachings of Fraser to use edge-delineated polygons or groups of pixels versus the previously used bounded boxes".

Such a suggested combination of references is understood to require a substantial reconstruction and redesign of the elements of the patent to Politis, as well as a change in the basic principle under which the method of Politis was designed to operate. More specifically, Applicants understand the bounding-box technique described in columns 12 through 15 of the Politis patent to require a completely different principle of operation that the edge-based methods of the Fraser patent. As a result, the Office is prohibited from establishing a prima facie case of obviousness against Claim 1 under MPEP § 2143.01:

> If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.

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For this additional reason, the Patent Office is not understood to have established a prima facie case of obviousness against amended Claim 1 over this art. Accordingly, Applicant respectfully requests that the rejection of amended Claim 1 be withdrawn for this additional reason.

MPEP § 2142 further requires that there be a reasonable expectation of success when modifying the art to produce the claimed invention and places the burden of proof on the Patent Office to support this conclusion. But, here, the Office Action provides no evidence that the bounding-box technique described in columns 12 through 15 of the Politis patent can be successfully interchanged with the edge-based methods of Fraser. Thus, the Patent Office is not understood to have established a reasonable expectation of success in modifying the references to produce the invention of amended Claim 1, as required by MPEP § 2142. For this third reason, the Patent Office is not understood to have established a prima facie case of obviousness against amended Claim 1 over this art. Accordingly, Applicant respectfully requests that the rejection of Claim 1 be withdrawn for this additional reason.

Since independent Claims 12 and 23 have been amended in a manner similar to Claim 1 and are corresponding apparatus and computer-readable-medium claims, they are understood to be allowable for similar reasons.

B. Independent Claims 7, 9, 18, 20, 29, and 31

Claim 7 is directed to a method of rendering an expression tree into a raster pixel image having a plurality of pixel locations. The expression tree has a plurality of nodes comprising one or more binary nodes and a plurality of leaf nodes. Each binary node has a left branch to a descendent node and a right branch to another descendent node and represents a binary operation

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on the two descendant nodes. Each node represents a graphic object having object edges, with one or more of the graphic objects overlapping. The overlapping graphics objects comprise a left node region, a common region, and a right node region.

The method comprises the step of determining groups of one or more pixel locations, wherein the groups are bounded by the object edges.

The method also comprises the step of determining, for each group, whether the left and right branches of the one or more binary nodes are active or inactive.

The method further comprises the step of traversing, for each group, the expression tree.

The traversing step comprises the substep of checking whether the right and left branches of a previously traversed binary node are active or a left node region is required for the binary operation of the previously traversed binary node and the left branch is active and the right branch is inactive of the previously traversed binary node, and if so, traversing the left branch of the previously traversed binary node to the descendent node.

The traversing step also comprises the substep of checking whether the right and left branches of the previously traversed binary node are active or a right node region is required for the binary operation of the previously traversed binary node and the right branch is active and the left branch is inactive of the previously traversed binary node, and if so, traversing the right branch of the previously traversed binary node to the descendent node.

The method further comprises the step of generating, for each group, operator instructions for any binary node traversed in the traversing step and having active right and left branches.

The method also comprises the step of generating, for each group, leaf value instructions for any leaf node traversed in the traversing step.

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Finally, Claim 7 recites the step of executing for each group, the generated instructions to render the graphic objects at the one or more pixel locations.

Thus, Claim 7 is directed to a conditional-traversal method for traversing an expression tree to generate instructions to render graphic objects or an image.

In contrast, neither the patent to Fraser, nor the patent to Politis is understood to disclose or suggest a conditional-traversal method comprising the substeps recited by Claim 7. Rather, as noted above, the Politis patent is merely understood to convert an expression tree into a corresponding render instruction set list and then, as a separate procedure, to construct a sorted render instruction list. And pages 47-49 of the patent to Fraser are merely understood to teach the evaluation of an entire expression tree and where appropriate, the generation of a null operation.

The discussion of the Politis patent on pages 12 and 13 of the Office Action includes several statements which Applicant (who is the assignee of the Politis patent) regards as inaccurate. For example, the Office Action states that the "... order of traversal of the nodes, which is explicitly recited in claim 7, corresponds to the preorder traversal taught by the Politis patent (see col. 14, lines 25-55) . . . . the trees are constructed during each scan line". Applicant respectfully disagrees with this reading of the Politis patent. The preorder traversal described at col. 14, lines 35-42 of the Politis patent is understood to visit every node in the tree to compute bounding box intersections, regardless of operator properties. In contrast, the present invention takes operator properties as well as branch activities into account to decide whether to continue with the traversal to current nodes' left and right descendant nodes. This conditional traversal is not understood to be taught or suggested by the patents to Politis or Fraser.

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In addition, as noted above, in the Politis patent, the trees are not understood to be constructed during each scan line. Rather, the tree is understood to be traversed at least three times — twice to generate and minimize the bounding boxes ("bottom-up or post-order", and then "top-down or pre-order"), and then once top-down — to generate the render list as described in column 12. All three traversals in the Politis patent are understood to be performed before the scan line-ordered rendering described in column 9, lines 31-43.

Thus, the patents to Politis and Fraser are not understood to disclose or suggest at least one feature of amended Claim 7. And since MPEP § 2142 requires the cited art to disclose or suggest all the claimed features to establish a prima facie case of obviousness, the Patent Office is not understood to have established a prima facie case of obviousness against Claim 7 over this art. Accordingly, Applicant respectfully requests that the rejection of Claim 7 be withdrawn.

In addition, the Patent Office is not understood to have established a prima facie case of obviousness against Claim 7 under MPEP § 2143.01 because, as noted above, the combining of the teachings of the patents to Politis and Fraser would change the principle of operation of the Fraser patent, and because the Office has not satisfied its burden of proof to establish that the bounding-box technique described in columns 12 through 15 of the Politis patent can be successfully interchanged with the edge-based methods of Fraser. Accordingly, Applicant respectfully requests that the rejection of amended Claim 7 be withdrawn for these additional reasons.

Since independent Claims 9, 18, 20, 29, and 31 have been amended in a manner similar to Claim 7, and since they are corresponding method, apparatus, and computer-readable-medium claims, they are understood to be allowable for similar reasons.
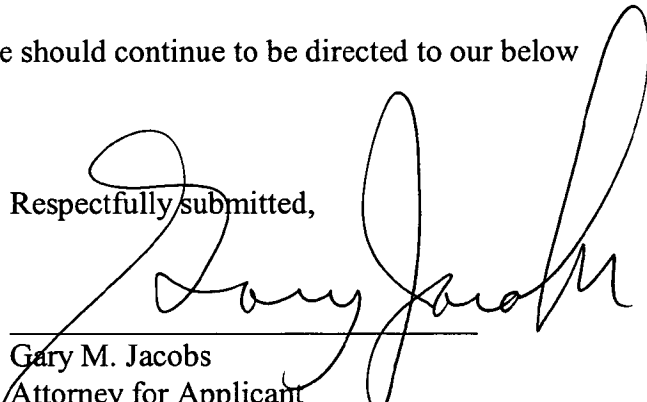
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C. Dependent Claims

The dependent claims are allowable for the reasons given for the independent claims and because they recite features that are patentable in their own right. Individual consideration of the dependent claims is respectfully solicited.

Conclusion

In view of the above amendments and remarks, the application is now in allowable form and entry of this Amendment is considered proper. Therefore, early passage to issue is respectfully solicited.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

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